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ZENKUTSU-DACHI

Innovation in Zenkutsu-Dachi foot position of the back leg

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Abstract

Zenkutsu-dachi model including the innovation through determining the position of the foot of the back leg, and through hidden explosive power, is briefly presented in this thesis. This model was born out of a long a dedicated study of this particular pose, and as a result of several years' worth of work. This position is the foundation for this thesis.

Results of this research points us to a significant qualitative change in motor capabilities of individuals when compared to the pre-existing Zenkutsu-dachi model.

Key words: Zenkutsu-dachi, foot, hidden explosiveness.

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1. INTRODUCTION

This is a pioneering attempt to contribute to Zenkutsu-Dachi stance, not by making new discoveries, but by applying basic knowledge of movement supported by many years of experience. While searching for the true causes of (non) functionality of Zenkutsu-Dachi, and listening to my body for two decades, a new solution was created. Particular attention should be paid to this during learning\teaching process.

A sentence of a Great teacher: *Turn your foot forward as much as possible* - was spoken just "like that" in passing. Then, *I want the fastest reaction* - was emphasized couple of times. Learn how to learn – was mentioned many times. (International seminar St. Prohor Pcinjski, September, 1991). This certainly had a crucial significance for working on constantly perfecting oneself, while reserving the right to respect the specificity. As a time Machine for putting together the mosaic, we cannot leave out the ascertainment that professor dr. Ukropina made in 1985 about the limited ability of the leg and correct movements of the knee, because of the foot position. I also have to mention professor dr. Radoslav Bubanj who gave the basic principles pertaining to biomechanics (1996/7). It was something that brought in a new light to the knowledge about facing oneself. That implied awareness and understanding of yourself, understanding functionality of Zenkutsu-Dachi, and knowledge about differences in the standard stance and something new. We have three basic hip positions in Zenkutsu-Dachi they are: Open, semi-open, and closed. According to this we have the change in the way that pelvis moves. Moving pelvis forward causes hip to shift. This pelvic movement is of vital importance and it has a functional role. It also has a sensory role, because of numerous muscle groups which create forces in different directions.

Zenkutsu-Dachi stance varies depending on stylistic organizations, Schools, teachers, instructors and trainers. Position of the back foot varies from 30 to 45 degrees in relation to the front foot or direction of the movement. This rule of the backfoot position is taught in schools and academies all over the world. By removing this unfortunate position of the back foot, a fuller use of speed and power of the technique is possible. It also serves as a preventive measure against a big number of toe, foot, knee and hip injuries.

So far, research did not give us a definite and complete answer to show how we can utilize our capacities to the fullest extent. It is daring to challenge statistical data and proven scientific ways of showing the strength of a stance, stability and transition from one stance to the other. In order to best use human potential, it is necessary for us to first decode ourselves and without preconceived notions begin using the natural foot position. It is important to pay attention to the back foot while changing the angle in order to achieve a more efficient position in terms of statics and dynamics.

My wish was for this writing to see the light of day. I wrote it supported by my desire to acquire new knowledge based on observation and experience. I wanted for the most competent scientists, researchers and unsurpassed practitioners to give their judgement.

It would be inhumane to give this study to somebody who does not have the knowledge; who doesn't recognize the importance that the foot position of the back leg has in Zenkutsu-Dachi. This stance represents the starting point and main source of power and speed. The feel, the essence and the act of the performing the technique by distinguished professor dr. Ilija Jorga are enhancing karate on The Way of Fudokan.

Stances in karate represent positions of the lower body, hips and legs. Form of the stance depends on the situation in which the mechanics is performed: defense or attack mechanics. Every stance characterized by good form, stability and balance is correct. Correct stance is extremely important for the ability to correctly perform proper mechanics, for speed and ease with the which a movement can be performed. Stability primarily depends on a position, height, center of gravity, and also the position of foot, thigh, knee and hip. Stability is greater when center of gravity is lower, and the support surface is wider

Zenkutsu-Dachi is a front stance. This is stance is also called pagoda stance because the position of the body resembles the roofs of Japanese building structures. The length of the stance is about two and a half times the width of the hips. The width of the stance is approximately the width of the hips. Front leg is bent at the knee. From the knee down, leg is perpendicular to the ground. Front foot is pointed forward. Back leg is straight (slightly bent in the knee), and the foot is facing forward. Both feet have to be completely flat on the floor. Body is in the upright position. 60% of body weight is on the front leg and 40% is on the back leg.

1.1. INNOVATION IN ZENKUTSU DACHI

Innovation in Zenkutsu-Dachi is reflected in the ankle mobility, therefore correction of the original angle of 30-45 degrees shouldn't be more than 20 degrees. Ideally the back foot would be at 0 degrees. in relation to the direction in which person is moving depending on the ankle flexibility or amplitude of the movement which gives a pleasant feeling by rotating foot forward (Photo No. 1).

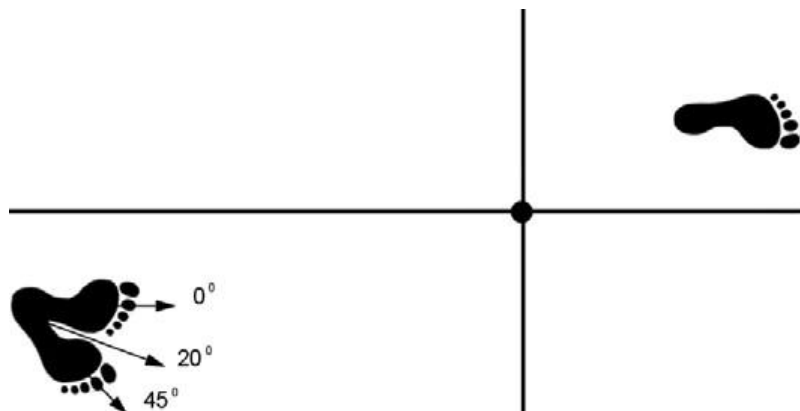


Photo No. 1. Innovation: Zenkutsu-Dachi

2. RESEARCH PROPOSITION, SUBJECT MATTER AND GOAL

There are very few written traces on the subject. Many individuals have been pursuing karate "seriously" for decades but one cannot get over the feeling that the approach is superficial. This is a pioneering effort which may be scientifically verified by those who are ready to face themselves and are able to scientifically prove all of this.

There were no radical changes before the Great teacher and creator of Fudokan. He is considered to be of the utmost importance since he created the framework for the process of promoting karate (Zenkutsu-Dachi).

Based on scripts and literature which were scarce, Funkoshi Gichin and his son Funakoshi Yoshitaka introduced certain leg techniques and enriched stances which are performed today. They both dealt with various issues and functionality of Zenkutsu-Dachi, particularly in regards to the position of the back foot. Based on the way Zenkutsu-Dachi is performed today, it is evident that Yoshitaka agreed with his father out of respect he had for him.

Shigeru Egami kept the foot position proposed by Gichin. He gave his contribution when it came to transitioning from one stance to another. He eliminated the movement in the form of arc, also called crescent moon and implemented the direct trajectory(back leg forward) with complete projection of energy on the target. Hidetaka Nishiyama (Photo No. 3) brought Yoshitakas' model of Zenkutsu-Dachi and Egamis' principle of transitioning from stance to stance back to life. In a way Kenwa Mabuni (Photo No. 4) performed the stance that Yoshitaka Funakoshi performed (Photo No. 2), but it was Dr. Ilija Jorga who completed and enriched all of it. Finally Zenkutsu-Dachi obtained a completed model which was more functional and efficient.

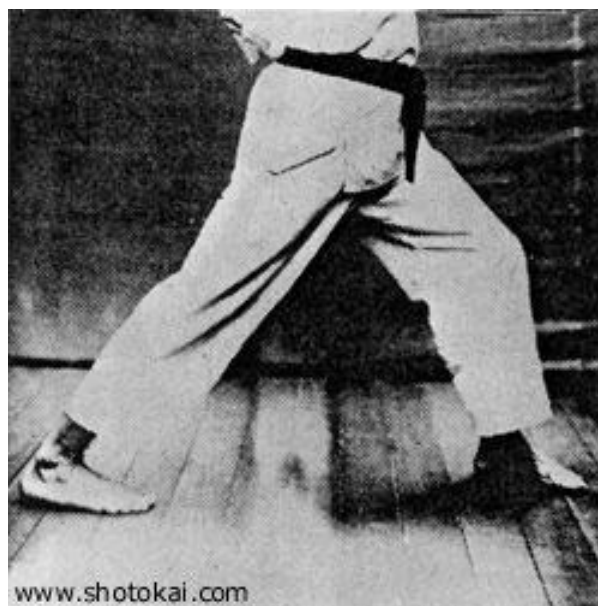


Photo No. 2. Yoshitakis' Zenkutsu-Dachi. Picture is worth thousand words

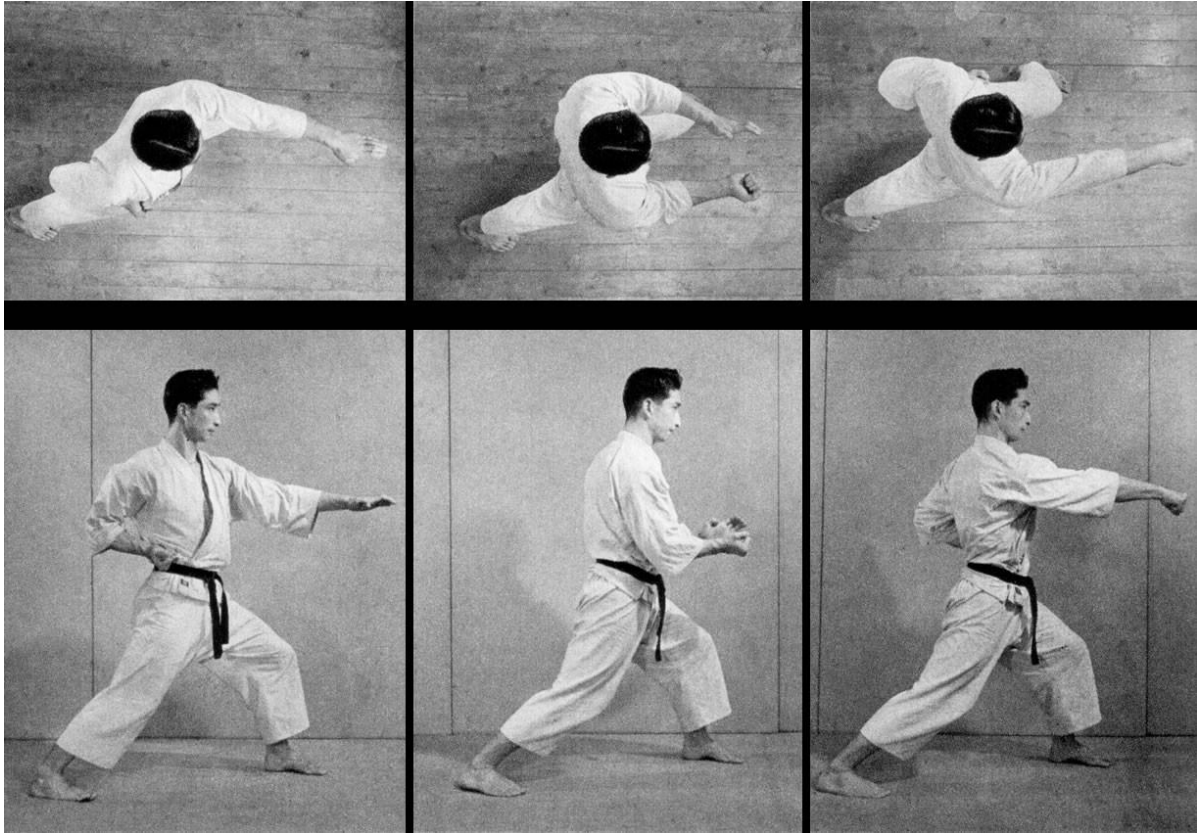


Photo No. 3. Nishiyamas' Zenkutsu-Dachi

Apparently, many followers did not pay attention to the basics and the essence of the stance, claiming that it was all defined long time ago. They did not take into consideration biomechanics, physiology, anatomy, kinesiology and so on.

After all, the natural position of the back foot in Zenkutsu-Dachi can be practically proven by those who have almost entirely mastered it, and those who are still working on perfecting it. Any other experimental and explorative attempts will not show true results. This is not a hypothesis that needs to be proven because it is based on decades-long, practical insight and experience. It would very meaningful for this to be scientifically proven and additionally enhanced. Turning practice into theory would essentially and most certainly give it an even greater importance.

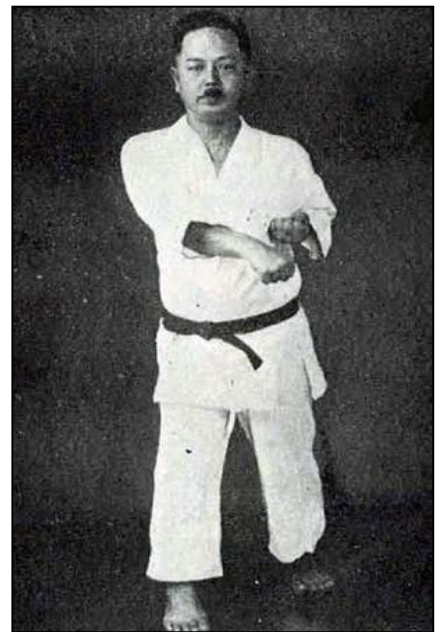


Photo No. 4. Kenwa Mabuni

For a more comprehensive understanding of the essence of Zenkutsu-Dachi, it is important to turn on the pre-accumulation phase (hidden explosive force) which can be seen as important and original research approach pertaining to the subject matter and to the effect of the action.

It offers a possibility for testing its' functionality and efficacy of adjusting the angle of the foot. The objective of this research is going beyond the accepted, standard way of practicing Zenkutsu-Dachi, as well as changing from one stance to another. Results vary depending on the height and length of the stance, as well as the surface, but the angle of the back foot plays a vital role in all these situations.

Where is the problem? In order to more seriously approach this matter, knowledge of physiology and biomechanics is needed. This time particular variations of the scholastic and fight stance of Zenkutsu-Dachi will not be examined even though it is the basis for the position, but this time it is not the subject matter. The angle of back foot should not be neglected as it is extremely important. **Hidden explosive power**, distance and angle of feet depends on individual anthropological characteristics. The most ideal angle of the back foot is 0 degrees in relation to direction of movement. The problem is the role that antagonistic muscles have and their immediate effect on kinematics and dynamics of movement, intensity and sequential action of muscular forces. Another issue is the muscle behavior and its place in the kinetic chain which consists of beginning position, duration and speed of the movement, in Zenkutsu-Dachi. Developing speed, and most efficient use of pre-determined speed, requires a very subtle intramuscular coordination of muscle groups in the lower extremities. The way that additional strength of the stance and therefore a stronger attack technique is produced, should also be looked at as well as the main moving force with or without a lunge. How explosive force functions with subtle and more spontaneous pressure on the surface where the position of feet, knees, and hips create coordination of movement while they cancel involvement of antagonist muscles, also needs to be closely examined. From a biomechanical standpoint, we should look at establishing of more favorable relation of body levers. Dynamic impact and dynamic response to impact, as well as comparison of parameters pertaining to the angle of the back foot and its role in showing the true state of the stance, should also be examined.

When we perform Zenkutsu-Dachi, we should listen to our bodies and work on strengthening the perception of wholeness of our bodies and correct our motor skills and relax. We should determine the cause and effect changes or identify the optimal foot angle of 20 degrees and the most ideal angle of 0 degrees. We should follow the dynamics of the stance as a whole, which is important for the formation of biomechanical structures of Zekuntsu-Dachi stance. An example of this technique of movement from this position would be the Gyaku technique of attack with or without a lunge. Justification of my work can be seen as an attempt to capture the essence of Zenkutsu-Dachi and discover the natural foot position which is the basis of the efficiency of its' use. Since stance is the foundation of the technique, I will use the example of the strongest hand punch – Gyaku-zuki, with and without a lunge. It is necessary to take a closer look and determine biomechanical base of the stance with the change of angle of the back foot accompanied by forward movement.

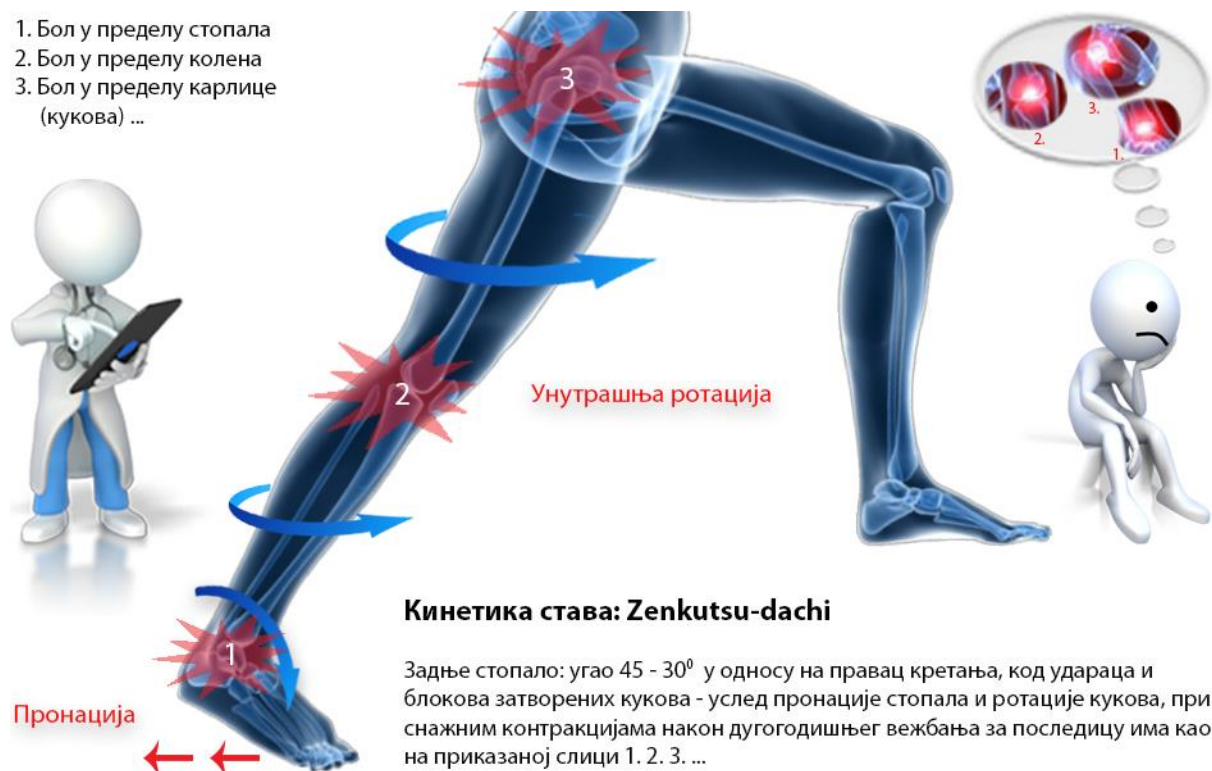
2.1. KINETICS OF THE ZENKUTSU-DACHI STANCE

Feet are one of the most important components of a stance as well as the first and most important part of the kinetic chain. Feet are the starting point in structuring of Zenkutsu-Dachi.

What happening in the joints?

Twisting of the foot of the back leg and the knee joint happens with execution of all techniques. It results in problem which is carried over to the hip. Whether it is the execution of a technique from a standstill position or while moving, pain could be a symptom of a serious injury.

Attention should be paid to the position of the foot of the back leg when it is at angle between 30 to 45 degrees (Photo No. 5).



Back foot position when punching and blocking with closed hips: angle 45-30 degrees in relation to the direction of the movement. Foot pronation and hip rotation while strongly contracted after many years of exercising cause problems shown above.

Photo No. 5. Kinetics of the Zenkutsu-dachi stance

Cause of the Problem - incorrect foot placement which can be carried over not only to the knees but much higher to the hips and the back. This problem is especially present during forward hip rotation with strong muscle contraction. Foot position has an enormous effect on the lumbosacral area as well as the upper back. Solution to this problem is a more natural positioning of the foot of the back leg. The most ideal angle is 0 degrees (Photo No. 6).



Иновација става: Zenkutsu-dachi

Задња нога је савијена у пределу колена, а стопало је под углом од $20 - 0^\circ$ у односу на правац кретања, код удараца и блокова затворених кукова. Тежиште става је између ногу - скоро 50-50%. Најидеалнији је угао од 0° у зависности од анатомске грађе и флексибилности стопала.

Back foot position when punching and blocking with closed hips: angle $20-0$ degrees in relation to the direction of the movement. The weight is evenly distributed between the legs – almost 50% - 50%. The angle of 0 is the most ideal, depending on the anatomy and flexibility of the foot.

Photo No. 6. Innovation in Zenkutsu-Dachi foot position of the back leg.

2.2. THE NOVELTY OF THIS RESEARCH

The Novelty of this research is:

1. Recognizing and gaining insight of the specificity of relaxed and tense muscles.
2. Hidden explosive force as an additional source of energy.
3. 0 degree position of the back foot during a strong contraction of the stance as an isolated movement in a standstill position or during explosives transition from stance to stance.
4. Increase in efficiency of muscle contraction.
5. Implementation of biomechanical into eccentric and concentric régime of the back foot position in Zekuntsu-Dachi at an angle a 45 degrees and maximum angle 20 degrees (depending on ankle flexibility). The most ideal angle would be 0 degrees.

The task is reflected in motor control: solve the problem of motor learning and efficiency of movement coordination and change of angle of the back foot in Zenkutsu-Dachi with and without a lunge. Foot position of the back leg has a primary role to produce the most efficient technique with the smallest energy expenditure.

Maximum speed attained when going from one stance to another is closely related to high coordination and synchronization of movements. The speed of change depends on reduction of flexion in the knees and ankles, and activity of knee extensors and plantar flexors. It should not be forgotten that resisting against the surface is a very important parameter,

because the surface reacts to pressure. Harmonious leg work is also needed. Potential energy is the main factor of maximum speed. It is reflected in engagement of a large number of functional, slow and fast motor units during the period of maximum frequency of voluntary exertion, which later becomes spontaneous or involuntary.

The task of changing from one stance to another in Zenkutsu-Dachi is to go from the illusory state of no movement into another stance as fast as possible.

The goal is to improve our capabilities, to aspire towards better synchronization and automation, and high rationalization. Faster transition from one stance to another is creation of the optimal model of Zenkutsu-Dachi which is based on synchronization of muscle groups and lever movements.

- Creating correct dynamic stereotype is the essence of success and it must have precisely defined methodology which is a long lasting process.
- Another goal is to more clearly experience the ease of knowing and mastering of Zenkutsu-Dachi, and to have complete control of it. In such a way the degree of successful performance of the attack technique such as Gyaku-zuki is higher.
- To produce the most efficient technique (Gyaku-zuki) with lunge and without, which lessens the possibility of injury to the foot and the knee, while utilizing natural positioning of the back foot with the least amount of effort and energy expenditure.

2.2.1. Example of testing maximum explosive force in Zenkutsu-Dachi.

Transition from one stance to another from a static position.

Take a stance. Do not move for two seconds. Arms are on the side for practical reasons, so they do not affect the ability which is being tested while moving from one stance to the other.

The standstill phase lasts for two seconds, in the classic transition (Photo No. 7.) and direct movement from one stance to another (Photo No. 8).

Examinee stands in the upright position Heiko-Dachi for a few seconds and then takes the Zenkutsu-Dachi stance and keeps still for two seconds. This is followed by a super fast transition and returning to the Zenkutsu-Dachi stance. End of test (Photo No. 7. and 8.).



Photo No. 7. Zenkutsu-Dachi, back foot is at a 45 degree angle. Classical transition

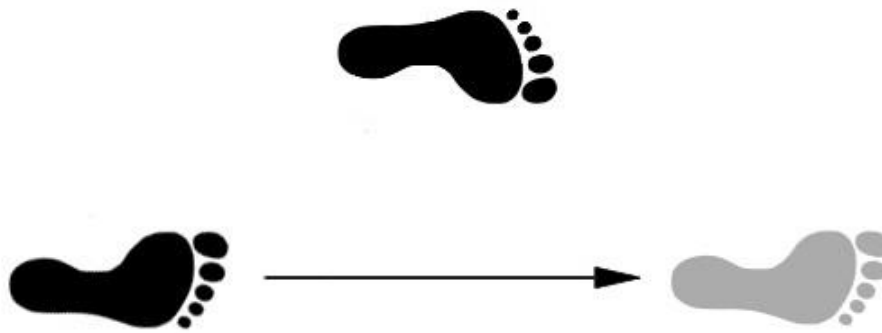


Photo No. 8. Zenkutsu-Dachi, back foot is at a 0 degree angle. Direct transition.

Based on examination of these two ways of performing Zenkutsu-Dachi, direct transition from one stance to another, proved to be more explosive.

Remark: Purpose of the test is to estimate the concentric component of stance explosiveness.

2.2.2. Explosive power of elastic character in Zenkutsu-Dachi

Explosive power - Some people define it as starting speed. It is the ability to activate maximum amount of energy in the shortest time by activating the most muscular units in a certain time period.

Examinee stands straight in a starting position with legs in the natural position. He lowers himself into Zenkutsu-Dachi stance, and without stopping and waiting, executes a complete transition from one stance into another which signifies the end of the test.(execution is shown in photo No. 7. and 8).

These two tests are examples of transitioning without the use of arms. True effectiveness of transitioning from one stance into another, depends on the correct use of arms which have to be properly utilized in the swinging motion (basal part of arm moves first) in order to achieve maximum transition from one position to another. Test is used to rate the explosive power of the stance.

Research findings show that direct transition from one stance into another in Zenkutsu-Dachi stance is more efficient if the foot of the back leg is at 0 degrees in relation to direction of movement, as opposed to 30 to 45 degrees used in the classical execution.

3. METHODOLOGY

Various methodologies are used in karate training. Effects that these methodologies have on development and improvement of certain characteristics and abilities doesn't only depend on content choices and instructors' teaching style, but it also depends on the method used to convey content, or more precisely, the teacher himself.

Nowadays, in theory and in practice during training and development of motor skills and karate techniques, there are many methods that are not entirely classified and systematized. There are basic methods which are most commonly used in karate training.

In the training process of learning karate, besides general methods used in learning of motor skills, special methods are also used which give karate specific methodological identity.

3.1. PROCESS OF PREPARING FOR EXERCISE

This process includes:

3.1.1. Regular exercise

In order to change the structure of the stance, it is necessary to change the internal essence which means being psychologically ready and open for new knowledge which will be manifested by the change of Zenkutsu-Dachi stance or by position change of the back foot. Personal insight will be created in accordance with characteristics of foot elasticity. Joint mobility is one of the basic functions of the locomotor apparatus. Construction and length of stabilizers affect mobility. If stabilizers are longer, mobility is greater. If the radiuses of projections and grooves the ankle area are smaller, mobility will be smaller, but the strength will be greater and vice versa. To ensure firmness and mobility it is necessary to exercise regularly.

3.1.2. Change of condition

It's necessary to listen to your body. With new experience comes new knowledge and with that, the recognition of students' sensory-motor relation with others. Internal strength is the essence of a person who feels the movement of the foot, free of past limitations. Ankle, knee and hip joints should be strengthened. Stretching exercises with holding of positions should be performed. Isometric contractions of all muscles that move the joints, overall conditioning exercises for free segments and the torso are important, and so is working on increasing flexibility. The power of reaction is crucial in order to efficiently perform any stance and technique through body dynamics. Muscle actions are supported by numerous physiological and biomechanical mechanisms. In this change of condition, it is very important to know which factors control muscle activation and degree of force. It is also important to know that number of motor units activated, are in large correlation with activation frequency of motor units. This increase in the amount of force produced,

means the muscles produce force, and functionality of the technique that's being performed. An example would be Gyaku-zuki technique of attack in Zenkutsu Dachi stance.

Corrections to be made:

- Project mental image of Zenkutsu-Dachi stance.
- Recognizing the differences between tension and relaxation of certain body parts and the body as a whole.

Experiencing these corrections is of crucial importance. It allows us to feel our bodies and what is happening inside our bodies, on the physical and mental plane.

3.1.3. Formation

Duration and degree of muscle contraction in Zenkutsu-Dachi depends on the position of the back foot. The process of forming the angle of the foot from 20 to 0 degrees reduces the strain in the foot and ankle, and therefore reduces the strain in the knee and the hip as well, therefore the biomechanical movement is more natural and reduces the risk of possible injury. This increases the power of leg muscle contraction, which is now much greater than it is in the standard Zenkutsu-Dachi stance. From a biomechanical standpoint, a much more favorable body lever is established (torso, thigh, lower leg), and it facilitates a more powerful stance - stronger contraction of functional muscles.

3.1.4. Development

When developing speed, the most efficient force is increased, caused by muscles pressing against the surface. That energy can be explained as movements' peripheral mechanism, which is the result of regulation of internal and external forces. This movement resembles the "Spring phenomenon". Tendons and ligaments behave as springs which store elastic energy. In this way, pushing the foot is reduced and it resembles a punch. While pushing off from the surface, there should be no pushing which happens during the execution of the punch. The main task is improving the speed of reflex. Fast muscle (motor) units are responsible for developing high degree of force, manifesting of large amount of force and speed which is to be used as an anaerobic source of energy. Quick transition from one stance to another is possible if high coordination of moves exists. One of the main goals is developing maximum speed from the initial acceleration. To obtain maximum speed, maximum force must be produced by slow and fast motor units. Maximum synchronization of muscle groups is also needed.

3.1.5. Control

In order to improve the control of Zenkutsu-Dachi stance, it is necessary to keep in mind the following: **Just as stance is the basis of the punch, feet are the basis of the stance.** Based on that, feet have a very important role when it comes to improving control of mobility. It is important to be completely aware of feet, soles and surface. The ability to keep track of the pressure and signal which appears in the foot, allows formation of stance model. Control is possible if closer attention is paid during practice and training, to the position of the foot and specifically the back leg, depending on whether the execution is

in the position of stillness or during movement. When putting a great amount of pressure on the surface, tension in the ankle, knee and hip can be regulated by keeping the foot of the back leg in correct position at the angle of 20 to 0 degree. The mechanism between the ankle and the knee has a big effect on overall stance of Zenkutsu-Dachi stance. Because of this it is important to achieve a high degree of control and precision with an understanding how this basic mechanism functions. Signals sent from the foot should be followed. The control of these signals is certainly possible and a lot easier than it appears because exercising barefoot additionally facilitates cognition of those signals which are part of a good model of Zenkutsu-Dachi stance.

3.1.6. Advancements

Advancement of skills and students' abilities and the skill mastery of an individual. The beginning and the end are the same in the spirit of Budo. At this point circle is closed and after this there is a new beginning and this goes on infinitely towards perfecting - the art of karate.

Model 1:

Beginning phase: Zenkutsu-Dachi stance

Beginning position - body is relaxed, seemingly at a standstill position from which it starts moving extremely fast.

Beginning position is taken in order to maximize speed and transition to another stance by stepping out forward, but before doing another move, one has to have the best support. At the beginning of performing the move outer force directed upward and forward is needed. In the moment of takeoff, surface reacts to the initial horizontal vertical force.

Model 2:

The source of horizontal force is in stretching of the takeoff leg and the swing of the front leg (swinging leg). The aim is to bring the center of gravity closer to the front leg while the back (swinging) leg is moving forward.

The back leg or takeoff leg begins moving with the knee forward and the front leg takes over the takeoff role of the back leg and quickly makes contact with the surface with the ball of the foot.

Front or supporting leg is bent in the knee and the lower leg forms an angle of about 45 degree in relation to the surface.

Foot is elevated toward the front of the sole (Ball of the foot).

In this phase, it is important to shift the weight of the back (swinging) leg to the front establishing a quick foot contact with surface. The back foot becomes the front foot and vice versa.

3.2. HIDDEN EXPLOSIVE FORCE

The beginning phase of the beginning phase - hidden explosive energy is seemingly a state of inaction. **Latent phase is the key of potential energy (Photo No.9). Energy is produced with both legs-feet, and with maximum speed and with short reaction, action on the surface and its' reaction.**

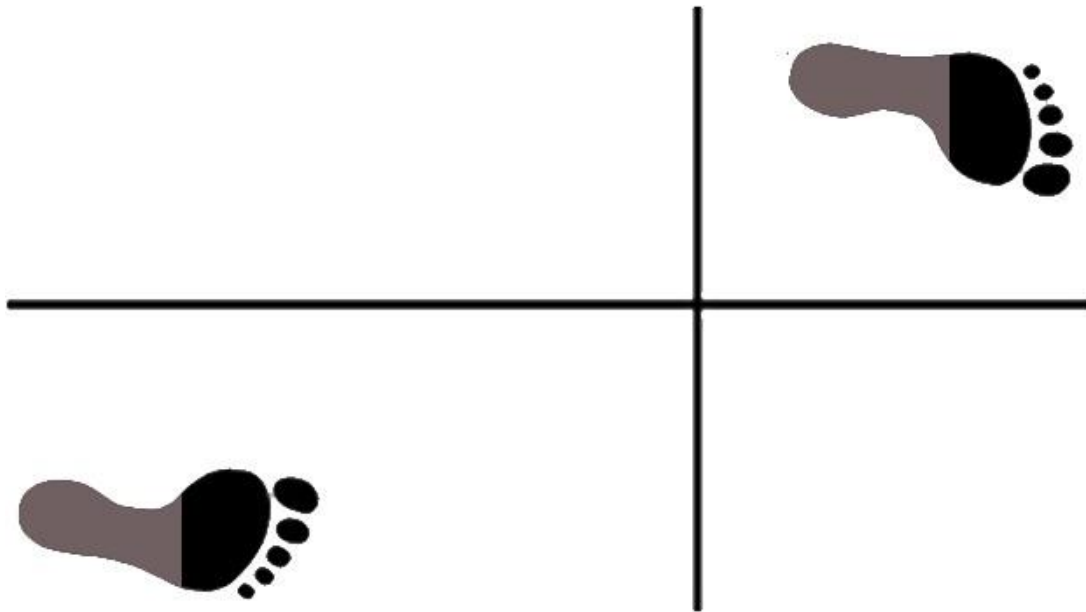


Photo No.9. The entire soles of the feet are seemingly touching the surface.

Ocean of potential energy is in leaning on the ball of the foot and in the fastest contact of the sole of the foot with a surface. The shorter the duration of contact, the stronger the force that acts on the surface. The same goes for the transition from stance to stance. The only difference is that process continues forward. Body is perpendicular to the ground with maximally relaxed legs in the moment of energetic takeoff. During transitioning forward to the front stance, the takeoff phase is preceded by a fast jerk (swing) of the arm. This action and reaction overtakes the whole body and causes a vibration which is at the same time an unavoidable and integral part of the movement.

After this, the so-called beginning phase of the movement follows - takeoff phase. Muscles develop a reactionary force, previously produced in the latent phase, but not in the classical way (taking off from the back leg and which then assumes the front leg position).

Biomechanical analysis of Zenkutsu-Dachi allows us to see biodynamic characteristics of movement or transition from one stance to another. This gives us biodynamic structure of Zenkutsu-Dachi. We should also mention that functional contradiction exists between various ways of taking the Zenkutsu-Dachi stance. This contradiction can be seen in attack technique which is performed with closed hips and in defense technique with closed hip in Gyaku form, as well as in the defense technique when hip is open.

3.3. BASIC PHASES OF NEWLY ADOPTED MOVEMENTS

Newly adopted foot movements can be shown in three different phases:

Phase 1: In the stance of relaxed immobility (relative muscle tone), muscles have a particular tension due to the pressure that the foot exerts on the surface. Ankles and soles of feet are particularly flexible and this movement flattens the arch of the sole of the foot. Feet are first widened, which causes the increase of potential energy (Photo No. 10.) when the body with its' entire musculature acts as a moving force.

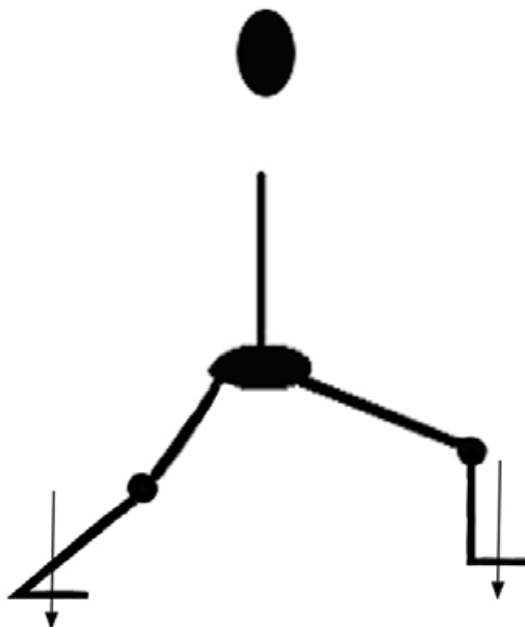


Photo No. 10. Zenkutsu-Dachi

Phase 2: Rotating ankles in place without stopping, and moving. One feels as if his legs are being nailed to the surface (Photo No. 11). During the movement, feet are contracting and arches become deeper. Sensation of knees opening outwards is also felt (Photo No. 11a).



Photo No. 11. Feet and 11.a Knees.

Phase 3: Continuation of phase 2. Apply additional pressure with feet to the surface while lowering the arch of the foot as in phase 1 but in a different way. More precisely, feet and ankles interplay in transferring the additional energy by the principle of unifying opposing forces. We get an impression that with application of strong force, the front foot wants to move backwards and the back foot wants to move forward. (Photo No.12).

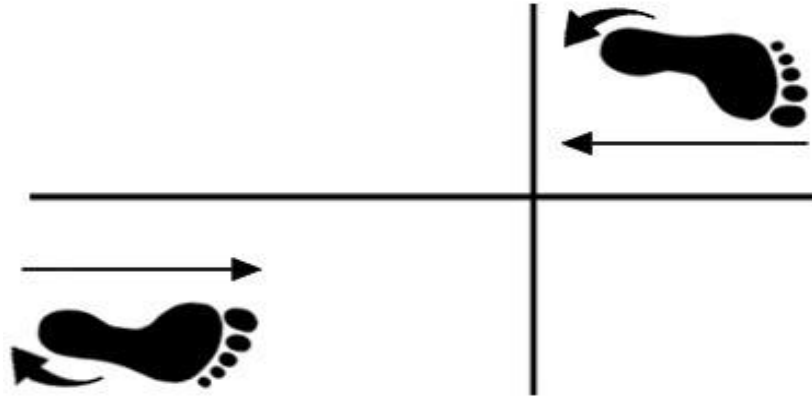


Photo No. 12.

All three phases are inseparable parts of one whole and they should be performed as fast as possible (less than a millisecond). This is about increasing of muscle force as a basic source of energy, without stopping and unnecessary movements.

Timely muscle contraction and de-contraction of Zenkutsu-Dachi stance is very important for performing the techniques which are caused by certain nerve impulses (example: Gyaku-zuki). Muscle is contracted as a response to stimulus which is transported by a particular nerve.

In order to perform the move quickly, it is necessary to be very relaxed and to then create a pre-tension and tension in tendons surrounding the ankle. This tension is further reflected on tensing of the muscles of the lower portion of the leg, which means that the foot affects the way lower part of the leg will move. This is inseparable connection between movements of the foot and the movements of the knee and the lower leg, gives a fuller picture of codependency.

Biomechanics and physiology are crucial for understanding the Zenkutsu-Dachi stance. They help us gain insight about mutual effect that forces have on each other, under which circumstances those forces act, and the type of exertion according to time and intensity.

In analysis of Zenkutsu-Dachi (Photo No. 13.) the source of force is very important. This source of force ensures a powerful stance and explosive power - motion, transition from a standstill stance to another stance (forward). Mastering and recognizing the value of this whole, is the beginning point in the described sequence of events (phases).

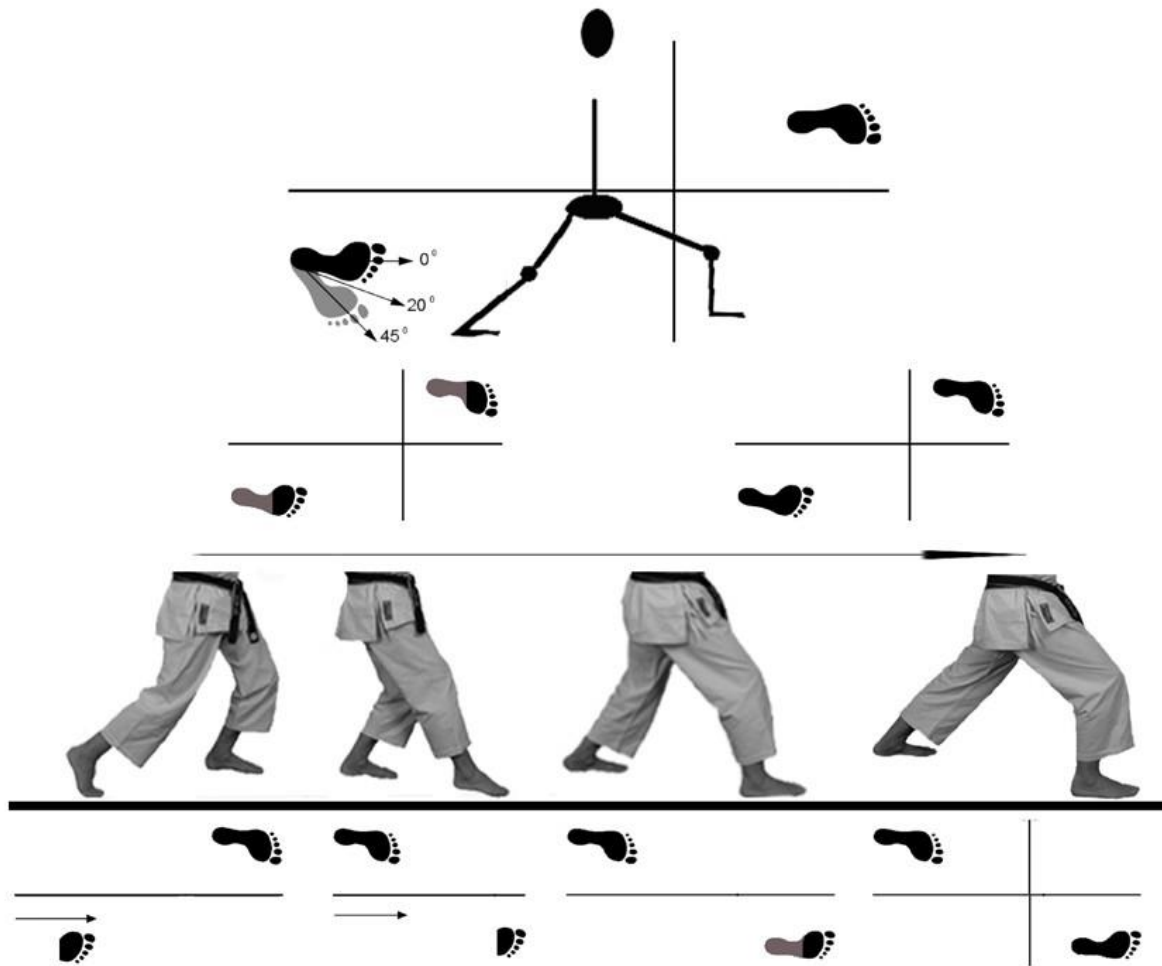


Photo No. 13. Zenkutsu-Dachi positions, movements of feet and their function

Foot support should be in the same direction as the direction of movement. Structure of the foot is very complex and so is the function or the ability of the foot to move in different directions. Foot changes its' shape when strongly contracted and has an effect on the explosiveness of the force of Zenkutsu-Dachi (standstill and in transitioning). The ability of ankles to move in different directions, allow the foot to adjust to conditions of transitioning from one stance to another.

Practical example of performing Gyaku-zuki in a standstill position, Zenkutsu-Dachi stance.

Gyaku zuki is a direct punch with a front part of the fist, and movement forward of the leg opposite to the punching hand. Gyaku-zuki is definitely one of the most efficient and most complex hand punches in karate. It's usually performed in Zenkutsu-Dachi stance (front stance), and the hitting surface is Seiken - Front part of the fist or place where index finger and middle finger joints connect those fingers to the hand. This punch is usually executed during counter attack so it is also known as forward hand counter punch.

1. *With exhaling - upper and lower extremities as well as the torso move toward each other and toward solar plexus as if they want to touch each other. When the body reaches this position it goes into a state of maximum contraction. In all of this we should not forget the importance of tucking in of pelvis. Simply put the body is maximally compacted and tightened and a strong contraction exists.*
2. *With fast and strong inhaling - followed by release of contraction right after, with insignificant raising and transfer of the weight to the front part of the foot of the front leg. Pelvis relaxes and moves backwards a little. Back leg is slightly bent in the knee and it's leaning against the surface with the entire foot.*
3. *While exhaling - in the same moment, punch is executed which replicates the previous condition. Feet are strongly pressed against the surface, the body falls with the rotation and vibration of the hips. Pelvis is tucked in, and with rotation of the fist the punch is executed while the other arm is being retracted and placed on the hip with maximum muscle contraction. Back leg is straight (slightly bent in the knee) and the body is straight as well. You should have a feeling as if you were sitting on your back leg.*
4. *With Inhaling - release of contraction happens fast and brings the organism to a relaxed state.*

After many years of such execution, new dormant functions are awakened, a feeling appears as a reward for the effort. Crossing over to a higher state of functioning of the entire body musculature happens. Body no longer needs the maximum beginning contraction to act as a moving force. Execution of movements is performed with relaxed musculature, with the whole being as a compact mass creating action in the same way as when we burn ourselves and we have a more complete reaction. At that moment we have a more complete reaction. We cannot neglect the subjective feeling that besides having all predetermined and acquired capabilities, speed plays the most important role.

When performing Gyaku-zuki, entire body should be involved in the movement and all functional muscle groups should be activated.

Basic principle during the execution of the punch: **basal part moves first followed by contact.**

In the moment when rotation is stopped along with vibration, coupling happens. Punch is executed using legs from the lower part of the body. The power the punch increases when body falls. The entire body should exert pressure on the surface with strong pressing of the foot. Front leg feels a tendency to move backwards and the back leg wants to move forward. Extended arm is the arm that executes the punch, for a moment it stays in that position, and mental power continues the projection of energy. Eyes should be focused on the opponents' body, or more precisely, we should be *looking through* the opponents' body without blinking. **Blinking diminishes the intensity of the punch; more precisely, mental force travels in waves (it's choppy).**

In the moment of execution of Gyaku-zuki punch which involves the whole body, all functional muscles contract strongly followed by de-contraction. Here is a practical example: If a contraction is short, we have a lever phenomenon but if the contraction lasts longer, we have the opposite effect. Breathing technique plays a very important role in the execution of the punch. It is important to breathe correctly. Breathing in helps with relaxation and breathing out helps with contraction. In the moment of execution of Gyaku-zuki by exhaling, explosiveness of the punch is increased. In order for the punch to be faster and stronger, it's important to understand the power of the psycho-physical factor.

The key to spontaneous (correct) technique is in gaining insight into the process of contraction and relaxation of tendons and muscles in the body. By mastering this process, you gain a fuller comprehension of the difference between tensed and the relaxed state. This segment is crucial for correct technique without effort in order to spontaneously execute the punch. Every individual is their own master of the moment in the mental and physical domain.

The effect of this type exercise is more valuable for the awakening of subtle sources of power and strength - mental power (mind). The power of the punch lies in the most subtle sources. They are reflected through the following components: physical (strengthening the body by mastering the of the physical), mental (intuitive), and spiritual. We should continuously work on turning the conscious and the unconscious into one in order to achieve the harmony of the spirit and the body.

The difference between the sport karate and budo karate is enormous, and that is expansion and retraction of Ki. The expansion of the mind before and after action is present in budo karate while it is missing from the sports karate.

Sensei Shojiro Sugiyama explained the essence of „Ki“ and practically proved that:

In bu-do, one's mental preparation and follow through are vital for an effective physical action. In bu-do, this means that one extends one's ki before an action and continues to extend his or her ki even after the action is completed.

He adds to this by saying that the technique of karate, should be strengthened. He explains how to contract the body using the "R" Ibuki breathing technique - method of contraction(using the tongue position for pronouncing "R" sound during an exercise). This does not create a problem for us, because we can clearly and perfectly say our hard "R". It's just one of the elements in a row that the nature gave us, so we should use it to our advantage in the spirit of the Art of Karate.

Exploration of higher levels of possibilities, discovers new facts about newly adopted functions of the foot which again becomes the basics (broadened), on the path of higher abilities of moving the angle of the foot of the back leg from 30° to 45° to 20° to 0°. Aspiration towards a fuller use of our abilities in general, leads us to overcoming the standard position of the foot in Zenkutsu-Dachi.

4. CONCLUSION

Described model of Zenkutsu-Dachi completes an important source of force which facilitates movement. By moving the position of the back foot (ankle) directly forward, creates a positive movement in the knee and hip joint. This means that the change of angle in the ankle joint (foot) results in change of movement in the joints of the knees and the hip.

Innovation of Zenkutsu-Dachi is reflected in the change of the angle of the back foot from 45 to 30 degrees to an angle of 20 to 0 degrees, primarily in attack and defense techniques performed with closed hips.

Hidden latent phase before the existing latent phase, results in fuller use of potential. This lifts the level of standstill position and transition to a higher level, because the connection between anatomical physiological abilities that is much stronger. Fuller use of the human body potential during an explosive movement of hidden phases becomes part of the whole, and depends on external and internal effects of forces. This has an enormous effect on the standstill and moving model.

Because of this long-lasting process of perfecting the techniques (of the stance), this complex techniques become simple's spontaneous and natural. Above all it is faster and more efficient and it is also beneficial for the health since it reduces the possibility of injury of the feet, knees and hips.

By changing the angle of the back foot in Zenkutsu-Dachi, and by perfecting this position, we solve numerous problems: explosive power, speed and force. Lever principle, and power impulse lessen the possibility of injury and it becomes a new way of successfully accomplishing a movement as well as the attack technique and transitioning (moving).

This newly adopted movement-position of the foot is possible on the path of higher capabilities if we focus on it and use it continuously. The effect that foot has in Zankutsu-Dachi, is of vital importance not only in karate but in Martial Arts in general, and in sports where the same stance (position) exists under another name.

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Author dedicates this thesis to his daughter Maja.

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